Performance Requirements Document
For Mid-Tier Networking Vehicular Radio
30 July 2012
v. 7

Aligned to

Directed Requirement (DR) for Mid-Tier Wideband Networking (MWN)
Capability for Brigade Combat Teams (BCT) dated 02February 2012

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1.0 Scope

This Performance Requirements Document (PRD) defines performance requirements for the Mid-Tier Networking Vehicular Radio (MNVR) set. The MNVR set is comprised of software and hardware consisting of operating and application software, Line Replaceable Units (LRUs), to include digital sections, analog sections, external power amplifiers, human-machine interface (HMI), intra-radio set connecting cables, and adapters/mounts for the LRUs. For reference (per AR 750-10), the Modification Kit (commonly called the A kit) is the assemblage of hardware and software necessary to modify the host system to accept the mounted system, such as power harnesses, shock isolators, ground busses, and cable clamps/guards. The Modification Kit is a permanent part of the vehicle and remains with it. The Installation Kit is the assemblage of hardware and software that interfaces between the modified host system and the mounted system and such as antennas, vehicle adaptor assemblies, vehicle mounts, and external connecting cables. The Installation Kit is intended for removal from the host system upon disposition and is not a permanent part of the host. The Installation Kit and MNVR set together are commonly called the B Kit.

This PRD is for the MNVR set only, and does not include the Installation Kit.

In this specification, the term “shall” is used to mean a minimum requirement. The term “objective” is used to denote a capability or function exceeding the minimum requirement. The terms “may” and “can” shall not be considered as requirements.

2.0 Applicable Documents

2.1 Government Documents

The following documents are part of this specification. Unless otherwise specified, the current versions of these documents shall be listed in the Department of Defense Index of Specifications and Standards (DODISS) and supplements thereto, as cited in the procurement documentation.

2.1.1 Specifications

The following specifications, standards and handbooks form a part of this document to the extent specified herein. The issue in effect at contract award shall be that revision listed in the Department of Defense Index of Specifications and Standards (DODISS) on the issue of this document:

2.1.1.1 Federal Specifications

Not applicable.

2.1.1.2 Military Specifications

MIL-DTL-64159	Coating, Water Dispersible, Aliphatic Polyurethane, Chemical Resistant
MIL-DTL-53039	Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant
MIL-T-704	Treatment and Painting of Material

2.1.1.3 Other Government Agency Documents

JENM ICD 1.1	JTRS Enterprise Net Manager Interface Control Document for WNW
JENM ICD 1.2	JTRS Enterprise Net Manager Interface Control Document for SRW
AJ 01288B	Software Loader Verifier Interface Control Document 15 April 2008
JPEO Memorandum dated 23	JTRS Criteria for ‘JTRS Compliant’ and ‘JTRS

January 2012	Certified' Designation
Unified ORD 3.2 and 3.2.1 Appendix E	Information Exchange Requirements

2.1.2 Standards

2.1.2.1 Federal Standards

Not applicable

2.1.2.2 Military Standards

MIL-STD-461F	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-810G	Environmental Test Methods and Engineering Guidelines
MIL-STD-1275B	Characteristics of 28Volt DC Electrical Systems in Military Vehicles
MIL-STD-2169B	High Altitude Electromagnetic Pulse (HEMP) Environment
MIL-STD-464C	Electromagnetic Environmental Effects E3 Requirements for Systems
MIL-STD-6017	DoD Interface Standard for Variable Format Message (VMF), 1 April 2004
MIL-STD-1472G	Human Engineering

2.1.2.3 Commercial Standards

ANSI Z535.4	Product Safety Signs and Labels
IEEE C95.1	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields
UL 969	Standard for Marking and Labeling Systems
UL 1950	Standard for Safety of Information Technology Equipment
NFPA 70-93	National Fire Protection Association 70-93

2.1.3 Army Regulations

AR 25-2	Information Assurance
AR 70-38	Research Development Test & Evaluation of Material for Extreme Climatic Conditions
AR 380-27	Control of Compromising Emanations
AR 70-75	DA Approved NBC Contamination Survivability Criteria for Army Material, 30 May 2005
TRADOC Regulation 350-1	Army Training and Leader Development

2.1.4 National Security Agency (NSA) Regulations and Specifications

IASRD Master Version: dated September 2011	Information Assurance Security Requirements Document (IASRD) Master Version: dated September 2011
IAD Management Directive No. 10 (MD-10)	NSA Information Assurance Directorate (IAD), Management Directive No. 10, Cryptographic Key Protection, dated 7 July 2005 & Alternate Cryptographic Key Protection Approach – Information Memorandum, dated 14 June 2007
EKMS 308 Rev. E	Data Tagging & Delivery Standard, dated 16 April 2008
NSTISSAM TEMPEST 1-92	National Security Telecommunications and Information Systems Security Advisory Memorandum (NSTISSAM) TEMPEST 1-92, Compromising Emanation Laboratory Test Requirements Electromagnetic, dated 15 December 1992
NSTISSAM TEMPEST 2-95	National Security Telecommunications and Information Systems Security Advisory Memorandum (NSTISSAM) TEMPEST 2-95, RED/BLACK Installation Guidance, dated 12 December 1985
CNSSAM/TEMPEST 01-02	Committee on National Security Systems Advisory Memorandum dated October 2002, Non Stop Emulation Standard
NSA TEMPEST Specification 91-25	NSA TEMPEST Specification 91-25 TEMPEST TESTING Requirements and Limits for RED Signaling Rates above 400 Mb/s/Hz/PIUs, dated 1 November 1993
TEMPEST Advisory Group	TEMPEST Advisory Group Memorandum V14-

Memorandum V14-042-00	042-00, Reduced TEMPEST Requirements for Endorsed TEMPEST Products, dated 1 March 2000

2.1.5 Other Publications

MIL-HDBK-46855	Guide for managing Human Factors Engineering Program
MIL-HDBK-454	General guidelines for Electronic Equipment
DOD 4120.24	Defense Standardization Program
DODI 6055.11	Protection of DoD Personnel from Exposure to Radiofrequency Radiation
DODI 8510.01	DIACAP Certification and Accreditation
DODI 8520.02	Public Key Infrastructure (PKI) and Public Key (PK) Enabling, dated May 24, 2011
CJCSI 6212.01	Interoperability and Supportability of Information Technology and National Security Systems
VICTORY Standard Specification	Vehicular Integration for C4ISR/EW Interoperability Standard Specification v1.0 dated 29 July 2011

2.2 Order of Precedence

In the event of a conflict between documents referenced herein and the contents of this PRD, the contents of this PRD shall be considered a superseding requirement. Nothing in the PRD, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.3 Document Sources

Copies of unclassified military specifications and standards can be obtained from the following sources as applicable:

a. ASSIST is the official source for specifications and standards used by the Department of Defense. http://dodssp.daps.dla.mil/

b. The DoD IT Standards Registry (DISR), is an online repository of IT standards formerly captured in the Joint Technical Architecture (JTA), Version 6.0. DISR replaces JTA.

c. Please note that access to the DISR online is limited to those who are directly involved with the development or support of projects, programs, or systems that make use of the DoD IT Standards Registry (DISR). Government contractors are required to provide their current contract number

and identify a military or government POC that can verify their justification for DISR online access. This system also requires a CAC for access.
https://disronline.csd.disa.mil

d. JTRS Information Repository
http://ir-public.jpeos.mil

e. The Army Publishing Directorate
http://www.apd.army.mil

3.0 System Requirements

3.1 DOD Architecture.

a. **The system shall be interoperable with joint critical operational activities and information exchanges identified in the DOD Enterprise Architecture and solution architectures based on the integrated DOD Architecture Framework (DODAF).**

b. It is an objective that the MNVR set interoperate with service specific and joint networks to the point achievable in legacy networks to satisfy 100% of top-level Information Exchange Requirements (IER) designated critical. See Appendix E of the Unified JTRS ORD 3.2 and 3.2.1 for the minimum essential IERs.

c. It is an objective that the MNVR set interfaces to external systems are compliant with the DoD IT Standards Registry in accordance with Department of Defense (DOD) 4120.24 and Chairman Joint Chiefs of Staff Instruction (CJCSI) 6212.01.

d. It is an objective that the MNVR set interfaces for voice, data, and operator control be easily accessible for the user during vehicle operation.

e. It is an objective that the MNVR set Ethernet interface(s) are capable of 10BaseT and 100BaseT.

f. It is an objective that the MNVR set provide a standard military audio connector to interface with the vehicle intercom system (i.e. VIC-3).

g. It is an objective that the MNVR set provide one standard military audio connector per voice channel.

h. It is an objective that the MNVR set be both compatible with VICTORY architecture and compliant with VICTORY Standard Specifications.

3.2 Secure Communications.

a. **The system shall provide secure and non-secure networked voice and data (Threshold) and video (Objective) exchange (i.e., mission command information)**

b. The MNVR set shall process voice and/or data classified up to Secret.

c. The MNVR set shall comply with the functional security requirements for the design and implementation of the software and hardware as specified in the Information Assurance Security Requirement Directive (IASRD).

d. The MNVR set shall be capable of receiving NSA certification in accordance with the applicable sections of the IASRD.

e. The MNVR set shall meet TEMPEST requirements per the IASRD, NSTISSAM TEMPEST 1-92, NSTISSAM TEMPEST 2-95, CNSSAM TEMPEST 01-02, NSA TEMPEST Specification 91-25, TEMPEST Advisory Group Memorandum V14-042-00, and AR 380-27.

f. The MNVR set shall be capable of receiving DIACAP certification in accordance with DoDI 8510.01 and AR 25-2.

g. The MNVR set shall implement PKI in accordance with DoDI 8520.02 which prescribes DoD PKI and PK-enabling activities.

h. The MNVR set shall have a key rollover operation and a key update operation as supported by WNW and SRW waveforms.

i. The MNVR set shall be able to receive and process keys generated by the Electronic Key Management System (EKMS 308 rev E) that are applicable to the WNW and SRW waveforms.

j. The MNVR set shall provide a means to declassify the MNVR set to a maximum classification of Unclassified Controlled Cryptographic Item (CCI). It is an objective that the MNVR set use a Cryptographic Ignition Key (CIK).

k. The MNVR set shall provide cryptographic key protection IAW NSA IAD MD-10 Directive.

l. It is an objective for the MNVR set channel classification levels to be independent of any other channel (Multiple Single Level Security).

m. It is an objective that only one type of cryptographic chip/module be used within the MNVR.

n. It is an objective that a single Cryptographic Subsystem (which may contain one or more cryptographic chips and/or modules) processes all secure channels.

o. It is an objective that all keys be loaded into the Cryptographic Subsystem via a single common fill port.

p. It is an objective that the MNVR set retains benign and black perishable cryptographic key variables for at least 96 hours after loss of primary power from a MNVR set power source.

3.3 Waveforms

a. **The system shall support the Wideband Networking Waveform (WNW) in the JTRS waveform repository, the Soldier Radio Waveform (SRW) (threshold), and the SINCGARS waveform (objective).**

b. T he MNVR set shall provide networked data communications using the JTRS WNW 4.0.5 or greater for the following modes: Orthogonal Frequency Division Multiplexing (OFDM) with rate code 19 and Anti-Jam with High Data Rate mode rate 4 at 10 MHz.

c. The MNVR set shall provide networked voice and data communications using the JTRS SRW version 1.01.1 or greater for the following modes: Combat Communications (CC) and Electronic Warfare (EW).

d. It is an objective that the MNVR set provide networked data communications using the JTRS WNW 4.0.5 or greater for all WNW OFDM data rates.

e. It is an objective that the MNVR set be JTRS compliant or JTRS certified IAW Joint Program Executive Officer (JPEO) JTRS memorandum Subject JTRS Criteria for 'JTRS Compliant' and 'JTRS Certified' Designation dated January 23, 2012.

3.3.1 Waveform Storage

a. It is an objective that all waveforms in the MNVR set be down-loadable and stored in non-volatile memory within the MNVR set.

b. It is an objective that the MNVR set have safeguards to reduce the possibility of unintentional reprogramming and to preclude the possibility of software storage errors.

c. It is an objective that the operator be notified when a waveform download was successfully completed or failed.

d. It is an objective that waveforms be authenticated after they are downloaded into the MNVR set.

e. It is an objective that the MNVR set be capable of storing presets and configuration information for communications waveforms that are not instantiated within the MNVR set.

3.3.2 Waveform Selection

a. It is an objective that the MNVR set allow an operator to select a waveform from non-volatile memory and instantiate it on any properly configured channel.

b. It is an objective that the MNVR set be able to prevent instantiating a waveform to an improperly configured channel.

c. It is an objective that the MNVR set provide positive confirmation following each successful instantiation and notify the operator in the event of failures.

d. It is an objective that the MNVR set allow operators to access and edit operating parameters loaded in the radio.

e. It is an objective that the MNVR set provide the capability to replace waveforms using a Software Loader Verifier IAW AJ01288B.

3.3.3 Receiver/Transmitter Protection

a. It is an objective that the MNVR set receivers sustain no damage when any combination of waveforms is operating at their highest RF output power.

b. It is an objective that the MNVR set transmitters sustain no damage when the RF output port(s) is open or shorted.

3.3.4 Waveform Electromagnetic Interference & Compatibility Characteristics

a. The MNVR set shall be mutually compatible with other spectrum dependent equipment within its intended environment(s).

b. The MNVR set shall comply with the requirements CE102, CE106, CS101, CS114, CS115, CS116, RE102, and RS103 of MIL-STD-461F as modified below.

(1). CE106 transmitter harmonics and spurious output emissions are limits apply. The transmit mode portion of this objective is not applicable within either the radio necessary bandwidth or plus or minus 5 % of the fundamental frequency. Test method CE106 or RE103 is acceptable.
(2). CS114 bulk cables injection susceptibility signals be IAW MIL-STD-461F, Figure CS114-1 (Curve # 3 {10 kHz to 2 MHz} & Curve # 4 {2 MHz to 30 MHz}).
(3). RE102 radiated emissions be limited IAW MIL-STD-461F, Figure RE102-4 (2 MHz to 18 GHz).

c. For each SRW and WNW Signal in Space (SiS) and allocated bandwidth, the RF energy applied to the antenna shall meet National Telecommunications and Information Administration standards. These emission limits apply to communication bandwidth less than plus or minus 5% of the fundamental channel frequency.

d. It is an objective that for each WNW Signal in Space (SiS) and allocated bandwidth, the RF energy applied to the antenna be as specified in Figure 3.1.

FIGURE 3.1 Normalized Spectrum Mask for WNW BW Allocations

3.3.5 Wideband Waveform RF

a. It is an objective that the MNVR set meet the wideband RF performance listed in Table 3.1 and 3.2, The minimum hardware bandwidth refers to selectivity by RF filters, the desired informational bandwidth is selectivity of both RF filtering and digital signal processing, and the required C/N is measured within the informational bandwidth.

Frequency Band	Offset Frequency	Desired CW Signal Level (dBm)	Undesired CW Signal level (dBm)	Desired Signal Bandwidth (kHz)	Required C/N with Undesired Signal (dB)	Minimum Hardware Bandwidth (kHz)
225 to 450 MHz	±1.8 MHz	-93	-57	960	11.9	1200
225 to 450 MHz	±3.6 MHz	-93	-39	960	11.9	1200
225 to 450 MHz	±4.5 MHz	-89	-53	2400	11.9	3000
225 to 450 MHz	±9 MHz	-89	-35	2400	11.9	3000
The signal levels at the antenna input in the 225 to 450 MHz band						
Desensitization is defined as the degradation in the C/N below the values given in the table.						

Table 3.1 WB RF Channel Port Desensitization Characteristics for 225-450 MHz frequency range

Frequency Band	Offset	Desired CW	Undesired CW	Desired Signal	Required C/N	Minimum

	Frequency	Signal Level (dBm)	Signal level (dBm)	Bandwidth (kHz)	with Undesired Signal (dB)	Hardware Bandwidth (kHz)
1200 to 2000MHz	±1.8 MHz	-98	-62	960	12.5	1200
1200 to 2000MHz	±3.6 MHz	-98	-51	960	12.5	1200
1200 to 2000MHz	±4.5 MHz	-94	-58	2400	12.6	3000
1200 to 2000MHz	±9 MHz	-94	-47	2400	12.6	3000
1200 to 2000MHz	±7.5 MHz	-92	-56	4000	12.3	5000
1200 to 2000MHz	±15 MHz	-92	-45	4000	12.3	5000
1200 to 2000MHz	±15 MHz	-89	-53	8000	12.3	10000
1200 to 2000MHz	±30 MHz	-89	-42	8000	12.3	10000
1200 to 2000MHz	±30 MHz	-86	-50	16000	12.3	20000
1200 to 2000MHz	±60 MHz	-86	-39	16000	12.3	20000
1200 to 2000MHz	±45 MHz	-84	-48	24000	12.6	30000
1200 to 2000MHz	±90 MHz	-84	-37	24000	12.6	30000
The signal levels at the antenna input in the 450 to 2000 MHz band						

Table 3.2 WB RF Channel Port Desensitization Characteristics for 1200-2000 MHz frequency range

3.4 Simultaneous Operations.

a. **The system shall be scalable and provide for the simultaneous operation of, at a minimum, 2 communications channels and be configurable to operate multiple waveforms (WNW, SRW, and objectively SINCGARS) simultaneously**.

b. The MNVR set shall be capable of operating combinations of waveforms (WNW-WNW (data), WNW-SRW (data); SRW-SRW (data and voice)).

c. It is an objective for the operator to have the capability to change a channel waveform, change the channel operating parameters, monitor channel performance, and turn a channel on/off without affecting the operation of other channel.

d. It is an objective that the MNVR set be capable of operating, continuously tuned from 225-450 and 1200-2000 MHz for channels operating WNW and SRW.

e. It is an objective that the MNVR set be capable of operating on multiple channels simultaneously with no more than 1.5dB reduction in range for any operating waveforms with channel spacing of 20% or greater.

f. It is an objective that each channel operating a waveform that permits voice operations has a volume controlled output.

g. It is an objective that each channel in the MNVR set operates independently and that a failure in one channel not degrade the operations of the remaining channels.

3.5 Waveform Performance.

3.5.1 WNW Performance

a. While operating WNW, the system shall provide a minimum throughput of 2 Mbps between a source/destination node pair operating in point-to-point mode, with a minimum line-of-sight range of 6 to 10 KMs, operating with a channel bandwidth not to exceed 5 MHz. The system shall provide a minimum aggregate network throughput of 200 kbps operating in a mission driven appropriately sized network (up to 30 nodes) with a channel bandwidth not to exceed 5 MHz under the anticipated operational conditions. Aggregate network throughput is measured as the sum of the offered load across all nodes in the WNW subnet.

b. The MNVR set shall provide a minimum 2 megabits per second user throughput using WNW OFDM rate code 19 (5MHz wide channel, diversity 1, DQPSK, Turbo ½ N=1) in the L-Band, at 6 kilometers between two individual nodes with one propagation path, no fading, and an attenuation of 141 dB. This path loss corresponds to Longley-Rice estimation, given conditions of 3 meter high antennas, confidence profile of 50%, hills of 90 meters, average ground conditions, and continental temperature in the L-Band.

c. The MNVR set shall meet the WNW message performance in accordance with the tables in Appendix A.

d. It is an objective that the MNVR set provide longer ranges and higher user throughput when measured against a path loss corresponds to Longley-Rice estimation, given conditions of 3 meter high antennas, confidence profile of 50%, hills of 90 meters, average ground conditions, and continental temperature in the L-Band.

3.5.2 SRW Performance

a. The MNVR set shall provide a 200 kilobits per second user throughput in SRW using CC/CSMA mode, with zero call groups, average packet size 600 bytes, using a 1.2MHz wide UHF-Band channel, at 2 kilometers between two individual nodes with one propagation path, no fading, and an attenuation of 122dB.

b. The MNVR set shall meet the SRW message performance in accordance with the tables in Appendix A.

c. It is an objective that the MNVR set provide longer range and higher user throughput when measured against a path loss corresponds to Longley-Rice estimation, given conditions of 3 meter high antennas, confidence profile of 50%, hills of 90 meters, average ground conditions, and continental temperature in the UHF-Band.

3.6 Size, Power, and Operational Environment

a. **The MNVR set shall meet the size, weight, and power (SWaP) constraints of the intended host platforms and minimize any degradation on existing mission effectiveness of platforms engaged in their operational environments, including movement, personnel ingress and egress, and weapons employment and firing and additional mission essential systems (e.g. Counter Radio-Controlled Improvised Explosive Device, Electronic Warfare, Mounted Optics).**

The characteristics that degrade mission effectiveness are:

(1). Size,
(2). Weight,
(3). Power,
(4). Warm start time.

The characteristics of platform operational environments are:

(5). Explosive atmosphere,

(6). Electromagnetic radiation hazards,
(7). Temperature,
(8). Altitude,
(9). Humidity,
(10). Salt-fog,
(11). Rain,
(12). Sand and dust,
(13). Vibration and environmental stress,
(14). Shock,
(15). Ballistic shock,
(16). Immersion,
(17). Air droppable,
(18). Fungus,
(19). Electromagnetic environmental effects,
(20). High altitude electromagnetic pulse,
(21). Near strike lightning,
(22). Electrostatic discharge,
(23). Directed energy,
(24). Chemical, biological, radiological and nuclear contamination.

Environmental testing shall be governed by Mil-Std 810G and Mil-Std 462 test procedures.

b. **The system shall be integratable onto relevant Army platforms**. Relevant platforms are HMMWV, MRAP, and Stryker. It is an objective that MNVR sets be integratable onto M1068, Bradley, Command Post Platform, and transit case.

3.6.1 Size

a. It is an objective that the two channel MNVR set including all ancillary couplers, amplifiers, sway space clearance, and installation mounts, not exceed a total envelope dimension of a typical SINCGARS AN/VRC-92F which consists of a Vehicle Adapter-Amplifier (VAA) measuring roughly 9”H x 16”W x 15”D and a separate PA/PA Mount measuring roughly 9”H x 5.8”W x 13.6”D; and co-exist within the same volume when two SINCGARS legacy ASIP radios are already present. These envelope dimensions are not to be combined. If designed as one contiguous unit, it is an objective that the MNVR set be limited to the envelope dimensions of the VAA.

b. The MNVR design may re-use existing legacy SINCGARS ASIP radios and PAs into the MNVR set integrated system. The system can be modular in form and function to meet SWaP requirements.

3.6.2 Power

a. The MNVR set shall utilize vehicular power to operate from a nominal 28 Volt DC power source. The MNVR set shall comply with MIL-STD-1275B.

b. When interfacing with or disconnecting from power sources, the MNVR set shall be in accordance with NFPA 70-93, and UL 1950.

c. It is an objective that the MNVR set be protected from damage when connected to incorrect input power/voltage levels or polarity.

d. It is an objective that the MNVR set incorporate power management to achieve maximum efficiency.

e. It is an objective that the MNVR set have a configurable capability to be provided from the platform power source to limit the peak and average power consumed by the MNVR set.

f. It is an objective that the MNVR set have power setting in increments of 100 watts starting from 300 watts and be designed for flexibility to enable the operator to prioritize affected channels.

g. During the loss of prime power, it is an objective that the MNVR set retain all radio configuration and waveform parameters stored or in operation at the time.

3.6.3 Start-up Times to Operation

3.6.3.1 Cold Start

From a cold start, it is an objective that the MNVR set be fully operational (enter into network(s)) within 11 minutes for a two channel configured MNVR set. Cold Start is defined as the process of making the MNVR Set fully operational in networks after a lengthy storage (30 to 60 days), as in a secure motor pool between training events, or missions. At cold start, the MNVR set has factory loaded operating software and mission waveforms. Cold Start includes any of the following as applicable to the design approach: Power on, Power On Self Test, loading keys, and loading waveform configuration parameters, instantiating waveforms in channels, and become operational in the waveform networks. If needed, fill devices that have stored keys and radio and waveform configuration data are readily available.

3.6.3.2 Warm Start

From a warm start, it is an objective that the MNVR set be fully operational (enter into network(s)) within 5 minutes for two channel configured MNVR set. Warm Start is defined as restarting the MNVR set following an orderly shutdown, and includes the process of making the MNVR set fully operational in networks. All waveforms, waveform configuration data and keys have been retained in the Set. Warm Start includes any of the following as applicable to the design approach: Power on, Power On Self Test, instantiating waveforms in channels, and become operational in the waveform networks.

3.6.3.3 Voice Start

It is an objective for the MNVR set to have a voice capability operational within 63 seconds from a warm start.

3.6.4 Operational Environment

3.6.4.1 Explosive Atmosphere

The MNVR set shall not cause ignition of the ambient explosive-gaseous air mixture.

3.6.4.2 Electromagnetic Radiation Hazards (EMRADHAZ)

a. The MNVR set shall not pose a hazard to personnel, fuels and ordnance from hazardous effects of electromagnetic radiation, not ignite or degrade electrically initiated devices, and not inadvertently ignite fuels.

b. Hazards of Electromagnetic Radiation to Ordnance (HERO). The MNVR set radiation shall not ignite or degrade electrically initiated devices (EID).

c. Hazards of Electromagnetic Radiation to Fuel (HERF). The MNVR set radiation shall not inadvertently ignite fuels.

d. Hazards of Electromagnetic Radiation to Personnel (HERP). The MNVR set shall comply with DODI 6055.11 for an exposure of 1 mW/cm^2 or 0.4 W/kg.

3.6.4.3 Temperature

a. The MNVR set shall operate at high temperatures up to 55°C and low temperature of -30°C.

b. It is an objective that the MNVR set operate in a wide range of environmental conditions with solar loading. It is an objective that each MNVR set be guided by operational, storage, and transit specifications for the hot, basic, and cold climatic conditions IAW AR 70-38 and MIL STD 810G. The objective high temperature limit is 71°C. The objective low temperature limit is -40°C.

c. It is an objective that the MNVR set automatically shut down if operating temperature limits are exceeded.

d. It is an objective that the MNVR set provide a control option to override automatic temperature shutdown.

3.6.4.4 Altitude

It is an objective that the MNVR set survive transport and storage in a military aircraft. It is an objective that the MNVR set be capable of operation during exposure to altitudes of up to 15000 ft.

3.6.4.5 Humidity

It is an objective that the MNVR set operate with relative humidity from 5% to 95 % non-condensing and conditions of mist and fog.

3.6.4.6 Salt-fog

It is an objective that the MNVR set be resistant to the corrosive effects of salt-sea atmosphere.

3.6.4.7 Rain

It is an objective that the MNVR set be capable of operating in 1.8 inches of rain per hour and 40 mph wind for 40 minutes.

3.6.4.8 Sand and Dust

It is an objective that the MNVR set not be damaged by exposure to fine dust particles, in wind speeds of 1,750 feet per minute and sand particles, in wind speeds of 5,700 feet per minute.

3.6.4.9 Vibration and Environmental Stress Screening (ESS)

It is an objective that the MNVR set, while on the move, survive vibration induced by vehicular transport (both tracked and wheeled) over all types of roads and cross country terrain and vibration associated with transportation.

3.6.4.10 Shock

It is an objective that the MNVR set and individual items within the equipment survive shock associated with servicing and handling, and during ground, rail, sea and air transport. It is an objective that the equipment not break away when subjected to crash hazard conditions.

3.6.4.11 Ballistic Shock

It is an objective that the MNVR set survive shock associated with gunfire and direct and indirect fire experienced within an armor vehicle.

3.6.4.12 Immersion

It is an objective that the MNVR set survive environments that may be encountered when fording or when the MNVR set is immersed in water.

3.6.4.13 Air Droppable

It is an objective that the MNVR set be air droppable.

3.6.4.14 Fungus

It is an objective that the MNVR set withstand, in both operating and non-operating conditions, exposure to fungus growth as encountered in tropical climates and not support fungal growth.

3.6.4.15 Electromagnetic Environmental Effects (E^3) Survivability

a. It is an objective that the MNVR set be internally and externally compatible with other equipment within the system's expected operational electromagnetic environment.

b. It is an objective that the MNVR set not produce electromagnetic emissions that interfere with or degrade the performance of existing platform/dismounted Warfighter instrumentation, weapons, sensors, or communications subsystems operating within its range.

c. It is an objective that the MNVR be compliant with applicable DOD requirements from MIL-STD-464C (platform level) and MIL-STD-461F (box and subsystem level) for all electromagnetic disciplines, including electromagnetic interference/electromagnetic compatibility with itself and other systems in the operating environment; hazards of electromagnetic radiation to personnel, ordnance, and volatile materials; and natural phenomena effects of lightning, electrostatic discharge and precipitation static.

3.6.4.15.1 High Altitude Electromagnetic Pulse (HEMP)

It is an objective that the MNVR be capable of mitigating the effects of a High Altitude Electromagnetic Pulse (HEMP) event by using system redundancies and geospatial diversity. It is an objective that the MNVR survive HEMP to the degree specified in MIL-STD-2169B but not be required to work through the event.

3.6.4.15.2 Near Strike Lightening (NSL)

It is an objective that the MNVR set be able to perform all its mission essential communication functions following exposure to the NSL events, per Table 3.3.

Near Strike Lightning	
Magnetic Field Rate of Change at 10m	2.2E9 A/m/s
Electric Field Rate of Change at 10m	6.8E11 V/m/s
Maximum Electric Field at 10m	3.0E6 V/m

Table 3.3 Near Strike Lightning Field Information

3.6.4.15.3 Electro Static Discharge (ESD)

It is an objective that the MNVR set be safe for transportation, storage, handling and operation at the completion of personnel-borne ESD, MIL-STD 464. See Table 3.4.

Personnel-Borne ESD Environment		
Voltage (V)	Capacitance (pF)	Series Resistance (ohms)
25,000 ± 500	500 ± 5%	500 ± 5%
25,000 ± 500	500 ± 5%	5000 ± 5%

Table 3.4 Personnel-Borne ESD Environment

3.6.4.16 Chemical, Biological, Radiological, or Nuclear (CBRN)

a. It is an objective that the MNVR set be designed to enable operators to perform all tasks while in Mission Oriented Protective Posture IV (MOPP IV) protective gear and during extreme environmental temperatures (hot or cold). It is an objective that, under such stress conditions, the allotted time for a task be no more than twice the time allowed under normal operations.

b. It is an objective that the MNVR set survive the effects of CBRN contamination and must be useable by soldiers in MOPP IV, and be able to conduct its mission while contaminated for 72 hours without failure due to contamination.

c. It is an objective that the MNVR set components survive CBRN decontamination processes and decontamination solvents in accordance with DA Approved Nuclear, Biological, Chemical Contamination (NBCC) Survivability Criteria for Army Material.

3.7 Position Location Information (PLI).

a. **The system shall securely transmit position location information (PLI) automatically or when queried (unless in radio listening silence mode via over-the-air/network) in the Military Grid Reference System**.

b. Variable Message Format (VMF) shall be used for the message report in accordance with MIL-STD-6017 and VMF message K05.1 shall be used for the position report.

c. It is an objective that the MNVR set transmit its PLI in latitude and longitude format to Mission Command and network management systems.

d. It is an objective that the MNVR set provide the set's PLI on demand-to the operator in latitude and longitude.

e. It is an objective that the MNVR set receive PLI from an internal GPS source or from another GPS system on the platform if available.

f. It is an objective that the MNVR set have a Selective Availability Anti-Spoofing Module (SAASM) based GPS receiver.

g. It is an objective that the GPS receiver have a Precise Time & Time Interval (PTTI) output.

h. It is an objective that the MNVR set GPS source be capable of receiving commercial and military GPS signals.

3.8 Route and Retransmission.

The multichannel system shall provide the Warfighter the ability to crossband (logically connect) independent voice and data networks using SRW and WNW (WNW-WNW (data), WNW-SRW (data); SRW-SRW (data and voice)) and objectively SINCGARS.

3.9. Network Manager

a. **The system shall support the network manager's abilities to over-the-air zeroize/rekey, plan, manage, and monitor the system locally and over the air. After receiving the network manager's command, the system shall support a mid-tier network unit task reorganization of a company with a BCT within 10 minutes as a pre-planned operational mission configuration**.

b. The MNVR set shall be interoperable with the JTRS Enterprise Network Manager for WNW IAW JENM ICD 1.1 and for SRW IAW JENM ICD 1.2.

3.10 Availability

a. **Each individual channel of the system shall provide an operational availability (Ao) of at least 96%**.

b. The MNVR shall provide prompting, cues, informative feedback and status, simple error handling, or help functions to operators and maintainers.

c. It is an objective that the MNVR system design facilitate ease of training and system operation while minimizing training costs and time.

d. It is an objective that the design limit the sophistication of skills required to operate and maintain the system/equipment to those already possessed by personnel operating and maintaining legacy radio systems.

e. It is an objective that the MNVR Radio set not cause an increase in the number or characters of skills Military Occupational Specialty of personnel required to operate and maintain the system, or introduce new tools or test equipment that is not part of the present DoD suite of tools and Test, Measurement and Diagnostic Equipment.

f. It is an objective that training support packages designed and developed for New Equipment Training and sustainment training be IAW TRADOC Regulation 350-1.

3.10.1 Maintainability

a. It is an objective that the MNVR set support hardware maintenance and reconfiguration activities in a forward area maintenance environment. It is an objective that the maintenance concept for repair of failures be replacement of LRUs to restore the equipment to operational readiness. It is an objective that LRUs be replaceable without cutting any wires or unsoldering any connections. It is an objective that no modifications to the ground vehicular structures be necessary to install, replace, or perform maintenance.

b. It is an objective that the MNVR set be constructed to provide ease of maintenance, accessibility and replacement of all modules and parts.

c. It is an objective that the MNVR set have maintenance and test access capability that permits authorized personnel to troubleshoot the radio while installed on the platform.

d. It is an objective that similar units, such as assemblies, subassemblies, modules, and replaceable parts be physically and functionally interchangeable, without modification of such items or of the equipment. It is an objective that

system design and construction make it impossible to install equipment incorrectly, or to attach cables, electrical plugs, and any other such items in an improper manner.

e. It is an objective that the MNVR set's Mean Time to Repair ($MTTR_{field}$) not exceed 30 minutes and Maximum Time to Repair (Max TTR) not exceed 60 minutes.

3.10.2 Built-In-Test (BIT), Built-In-Test Equipment (BITE)

a. It is an objective that the MNVR set perform commanded BIT and/or continuous BIT to detect and locate faults. It is an objective that continuous BIT not inhibit any equipment operational mode or function; that commanded BIT not inhibit any equipment operational mode or function without operator approval.

b. It is an objective that the BIT diagnostics be capable of fault detection of at least 95% of all faults and be capable of fault isolation to a single LRU of at least 90% of detected faults.

c. It is an objective that audio and visual signals be provided to alert an operator to a critical change in system or equipment status. It is an objective that the alarm audio output volume be adjustable and have a mute capability.

d. It is an objective that the MNVR set perform BIT on command by the operator or maintainer and not require further operator intervention after initiation.

e. It is an objective that while operating, the MNVR set execute a continuous BIT of each channel, and that BIT and BITE reports be displayed. It is an objective that the BIT and BITE reports indicate which LRU(s) have fault(s) and provide the operator with status when a fault is detected.

f. It is an objective that, when channel faults are found, the capability to use the channels with no faults be provided.

g. It is an objective that commanded and continuous BIT false alarm rates not exceed 5 %.

h. It is an objective that, during continuous BIT or commanded BIT, no RF radiation occurs unless manually enabled by the operator.

3.11 Suitability.

a. **The system shall allow a trained operator to load hardware/software and reconfigure the system's software in the operational environment without evacuating the platform to higher maintenance facilities.**

b. It is an objective that the MNVR set comply with the applicable core and domain Human Computer Interface mandates of the DoD IT Standards Registry.

c. It is an objective that the MNVR set provide a user interface that is uncomplicated, intuitive, efficient, and comply with MIL-STD-1472G and utilize MIL-HDBK-46855 as a guide for managing the HFE program.

d. It is an objective that two discrete actions be required by the operator to prevent loss of critical data that could disable or severely disrupt the system/mission.

f. It is an objective that the MNVR set have the capability to be reconfigured in an operational environment (on the platform) for hardware, software and firmware changes or upgrades.

3.12 Reliability.

Each MNVR channel shall provide a mean time between essential function failures of no less than 477 hours.

A failure is defined as any relevant Unscheduled Maintenance Action (UMA) required to restore the MNVR channel to the required performance. Relevant failures include only those events charged as attributable to hardware, software, or failure of the diagnostic system.

3.13 Counter Radio-Controlled Improvised Devices Electronic Warfare Devices.

The system shall operate in conjunction with counter radio-controlled improvised devices electronic warfare devices (CREW).

3.14 Growth Capability

a. **The system shall provide for internal growth, through an open systems design approach in compliance with the DoD Information Technology Standards Registry**.

b. It is an objective that the MNVR set incorporate a substantial growth capability (i.e., memory, throughput and processing capacity) to accommodate technology advancements and increasing warfighter requirements. It is an objective to have at least 50% capacity in reserve.

c. It is an objective that the design of the MNVR sets allows for technology insertion.

3.15 System Safety and Labeling

The equipment shall be designed so that under all conditions of normal use (installation, operation, maintenance) and under a likely fault condition (including human error), it protects against the risk of electric shock and other hazards. The safety and health hazards as stipulated in MIL-HDBK-454 shall be adhered to as a general rule.

3.15.1 Safety Markings and Labels

a. Safety markings and labels shall be provided identifying any potential hazards to personnel. Safety markings and labels shall comply with the requirements of ANSI Z535.4. RF radiation hazards and voltages in excess of 70V shall use the signal word WARNING. Voltages in excess of 500V shall use the signal word DANGER. Safety labels complying with the requirements of UL 1950, paragraph 1.7.15 and/or UL 969 are acceptable.

b. Markings shall be readily visible. They shall not be removed when a barrier or access door is opened/removed.

c. All safety hazards not eliminated through design shall be addressed in the appropriate technical manuals. Information regarding hazard-avoiding procedures and safety warning labels on equipment shall be included in all manuals. Maintenance technical manuals shall address replacement procedures for damaged or missing safety labels.

3.15.2 Microwave, Radio Frequency (RF) and X-Radiation Safety

a. All equipment capable of emitting RF or microwave radiation shall be designed to prevent overexposure of personnel during operation and maintenance. Personnel exposure to such radiation shall be limited to values listed in IEEE C95.1. Microwave or RF radiation labels shall warn personnel of danger zones.

b. Shields or covers requiring removal during maintenance that may cause radiation overexposure shall be interlocked (nonbypassable).

3.15.3 Chemical Safety

a. Hazardous materials that can be exposed to personnel (operator, maintenance, fabrication, etc.) or the environment shall be kept to an absolute minimum, consistent with operational requirements. Non-toxic/environmentally acceptable substitutes shall be used whenever possible from a cost effectiveness and operational point of view.

b. Hazardous material exposure to personnel shall be controlled to levels below the Occupational Safety and Health Administration Permissible Exposure Limits and the American Conference of Governmental Industrial Hygienists Threshold Limit Values.

c. Use of radioactive material shall be kept to an absolute minimum. Nonradioactive substitutes shall be used whenever possible. Where substitution is not possible, the least hazardous type and form of radioisotope shall be chosen.

3.15.4 Functional Marking

Connectors, keys, circuit breakers, jacks, switches, other controls and similar items shall be suitably designated by marking, adjacent to the item, on the surface upon which they are mounted. The marking shall be such that the function of the item can be readily identified by the equipment operator.

3.15.5 Marking Battery Circuits

a. Units designed to operate from internal batteries shall be marked with the following, in convenient form for use by operating and maintenance personnel:

- Battery type numbers.
- Battery location and position.
- Polarity.
- Nominal voltage.
- Interconnection between batteries, if two or more are used.
- Minimum acceptable voltage for equipment operation.

b. The markings shall be applied on or adjacent to the battery compartment or holder, and on adjacent to terminals, connectors, contacts, removable leads, etc., that is part of the battery circuit but not of the battery itself. When necessary to provide such information in convenient form, a block or pictorial wiring diagram of the battery circuit and batteries shall be provided instead of, or in addition to the markings, and shall be located on or as close as practicable to the battery compartment.

3.15.6 Warning Label

Battery-powered equipment, with the exception of equipment requiring permanent battery installation, shall be labeled externally as follows:

WARNING **REMOVE BATTERIES BEFORE** **SHIPMENT OR INACTIVE STORAGE**

3.15.7 Fuse Ratings

When space is available, the current rating of each fuse shall be marked on or adjacent to the fuse holder. Where slow-blowing type fuses are employed, the words “SLO-BLO” shall be marked in addition to the current rating.

3.15.8 Markings and Nameplate Data

It is an objective that the MNVR set hardware adhere to the marking, nameplate data, bar coding and labeling requirements as shown in Figure 3.2 and 3.3 below. It is an objective that the MNVR set components be marked with nameplate data regardless of whether the data is applied directly to a surface of the article or by means of an attached label. It is an objective that special characteristics as listed in Figure 3.4 also be marked on the nameplate.

1. Configuration Item Identification (S)
2. Serial Number
3. Bar Coded Serial Number (see figure 3.27.2)
4. Contract number
5. Nomenclature (item name and type designation) if available
6. Special characteristics
7. Design activity (CAGE code)
8. Part or Identifying Number (PIN) if available
9. Bar coded PIN when NSN not available (see figure 3.27.2)
10. Manufacturer identification (CAGE CODE)
11. Bar coded manufacturer CAGE code (see figure 3.27.2)
12. NSN if available
13. Bar coded NSN (see figure 2) if available
14. Controlled Cryptographic Item(CCI)

NOTES:
1. This example is given only as a guide and is not a mandatory format.
2. Bar code density is 6.5 to 9.4 characters per inch, height is 0.125 inch minimum.
3. Items 2, 8, 10 and 12 is used for Human Readable Interpretation (HRI) purposes for the associated bar code.
4. Additional information as applicable may be integrated into the identification plate or may be applied adjacent to the major portion, whichever is most suitable.
5. Permanent information including bar coding may be included on a plate separate from variable information plate.

Figure 3.2 Nameplate Data Example

VOLTAGE:_____VOLTS AC;_____VOLTS DC;_____VAC;_____VDC.

CURRENT:_____AMP;_____A;_____mA.

FREQUENCY OF POWER:_____HZ;_____HERTZ;_____.

PHASE OF POWER (if more than one phase) : 2-PHASE; 3-PHASE.

FREQUENCY, RADIO:_____HZ;_____KHZ;_____MHZ.

Figure 3.4 Special Characteristics

3.16 Other

3.16.1 Radio Silence

a. It is an objective that the MNVR set have the capability to be commanded by the operator to a radio silence, listening mode only. It is an objective that the MNVR set operating in this mode not perform over-the-air routing, nor transmit any management or acknowledgement information on any of its channels.

b. It is an objective that the MNVR set facilitate smooth transition to and from the receive-only and normal operations.

c. It is an objective that the operator be able to silence selective channels or all channels.

d. It is an objective that the MNVR set have an indicator that identifies the radio has been set to Radio Silent.

3.16.2 Lighting and Night Vision Goggles

a. It is an objective that the MNVR set operator interface be readable with 10,000-foot candle, direct sunlight.

b. It is an objective that the MNVR set be compatible with night vision goggles.

c. It is an objective that the MNVR set controls be capable of day and night operations.

3.16.3 Human/Machine Interface (HMI)

a. It is an objective that control of the MNVR set and operation of all channels be provided from a separate HMI device, and that the HMI device provide display as well as control of the functionality for each MNVR set channel.

b. It is an objective that the HMI be capable of operation up to 20 meters away from the MNVR set.

c. It is an objective that the HMI display all presets for each operational channel and that the presets be organized by type, and that the active presets be highlighted.

d. It is an objective that the HMI display the operational status of each channel and notify the operator when inoperable or degraded modes exist.

e. It is an objective that the HMI permit the operator or maintainer to execute commanded BIT and to observe system status indications and diagnostic results and that all system failures, faults and critical advisories be presented immediately to the operator in clear and unambiguous terminology.

f. It is an objective that the HMI, operating within or near the vehicle, derive its power from the same source as other MNVR set equipment.

g. It is an objective that the HMI be suitable for operation while the vehicle is on the move, and be suitable for use from any location within the vehicle.

h. It is an objective that the HMI provide network connectivity and link state.

i. It is an objective that the MNVR set have the capability for the operator to manually load MNVR set time through the HMI, in the absence of GPS and internal MNVR set time. (Note: Assume operator entered wrist watch time is accurate within +/- 1 minute of actual time of day.)

j. It is an objective for the HMI to notify the operator that a remotely initiated action had occurred.

k. It is an objective that the HMI provide positive confirmation following each successful key load and notify the operator in the event of key load failures.

l. It is an objective that the HMI notify the waveform applications within 5 seconds after Radio Silence is selected for either a selected channel or all channels operating in the MNVR Set.

3.16.4 External Host Control

a. It is an objective for the MNVR set to allow an external host to control the MNVR set.

b. It is an objective for the MNVR set to allow an external host to control the MNVR set and source traffic data.

c. It is an objective for the MNVR set to allow an external host to control the MNVR set and source traffic data over a common port.

3.16.5 Colors and Finishes

a. It is an objective that the color of external surfaces of the MNVR sets be Type II Chemical Agent Resistant Coating, color Green 383 in accordance with MIL-DTL-64159.

b. It is an objective that the pretreatment and finishes of external painted metallic surfaces be in accordance with the requirements of MIL-T-704 and MIL-DTL-64159 or MIL-DTL-53039.

3.16.6 Antenna Characterization

a. Assume system antennas will have a nominal input impedance of 50 Ohms

b. Assume system antennas will operate within the parameters shown in tables 3.5 and 3.6.

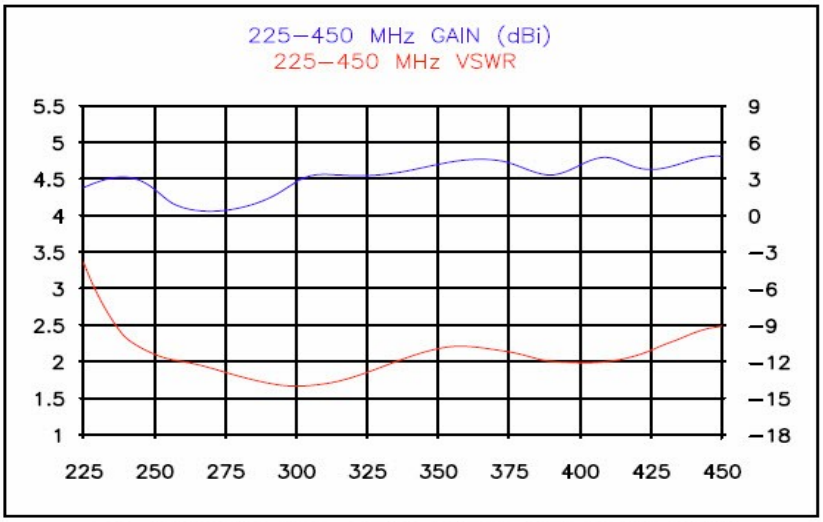

Table 3.5 Gain and VSWR for 225-450 MHz antenna

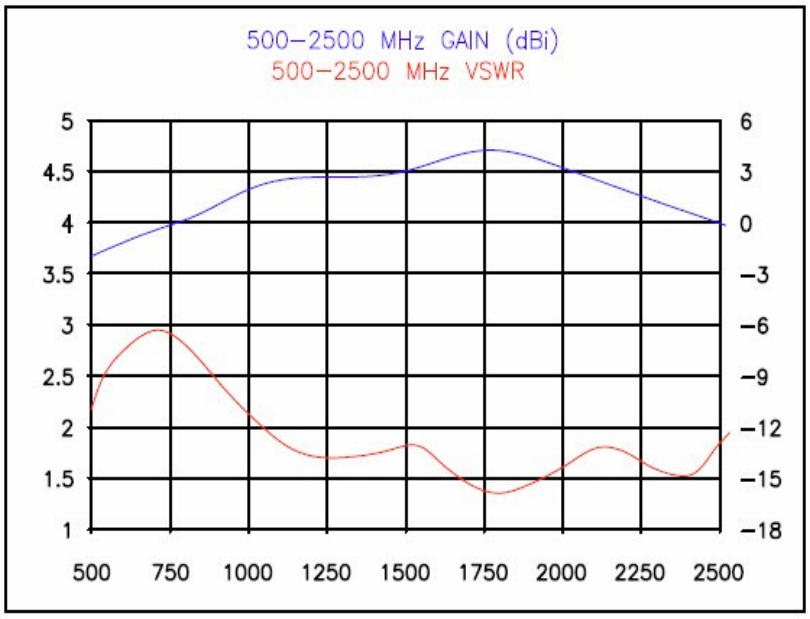

Table 3.6 Gain and VSWR for 500-2500 MHz antenna

Test Case	Number of Nodes	Number of Mobile Nodes	External Routes**	Frequency	Bandwidth	Archite
WNW Static	Up to 30	0	>=453	1350-1390 MHz or 1755-1850 MHz bands	Single5 MHz channel	Single Su

WNW Mobile	Up to 30	10 (at ground vehicular speeds up to 55 mph)	>=453	1350-1390 MHz or 1755-1850 MHz bands	Single5 MHz channel	Single Su

Test Case	**Area of Operations**	**Traffic Characteristics** (% measured by bytes)	**Multicast Me**
WNW Static	20km x 25km (Operationally relevant terrain / foliage / noise environment)	20% UDP MC (avg message size = 200 bytes) 20% UDP MC (avg message size = 800 bytes) 20% UDP MC (avg message size = 1200 bytes) 20% UDP UC (avg message size = 200 bytes) 10% TCP UC (avg message size = 40 kbytes) 10% TCP UC (avg message size = 100 kbytes) Bursty, non-uniform traffic	- 50% of multicast to group Dense) - 50% of multicast to groups nodes join (using PIM Spars
WNW Mobile	35km x 25km (Operationally relevant terrain / foliage / noise environment)	20% UDP MC (avg message size = 200 bytes) 20% UDP MC (avg message size = 800 bytes) 20% UDP MC (avg message size = 1200 bytes) 20% UDP UC (avg message size = 200 bytes) 10% TCP UC (avg message size = 40 kbytes) 10% TCP UC (avg message size = 100 kbytes) Bursty, non-uniform traffic	- 50% of multicast to group Dense) - 50% of multicast to groups nodes join (using PIM Spars

APPENDIX A: WAVEFORM MESSAGE PERFORMANCE

*Offered load is defined as the sum of the load offered to the network across all nodes. Each unicast and multicast message is counted once regardless of the number of destinations.

**External routes to emulate the OSPF routing protocol advertisement/information exchanges from the additional WNW nodes in a BCT and 300 routes from external network advertisement.

Table A-1 WNW Performance Test Cases

TRAFFIC TYPE	MSG SIZE	% Bytes	% Messages	Messages / Minute (200 kbps Offered Load)
UDP MC	200 bytes	20%	41.33%	1500
UDP MC	800 bytes	20%	10.33%	375
UDP MC	1200 bytes	20%	6.89%	250
UDP UC	200 bytes	20%	41.33%	1500
TCP UC	40 Kbytes	10%	0.10%	3.75
TCP UC	100 Kbytes	10%	0.02%	1.5

Table A-2 WNW Traffic Profile

PRIORITY LEVEL	MSG SIZE	% Messages	MCR	MSG Latency*
FLASH OVERRIDE	200-800 bytes	3%	95%	1 sec
FLASH	200-800 bytes	6%	95%	1 sec
IMMEDIATE	200-800 bytes	9%	90%	2 sec
PRIORITY	200-1400 bytes	32%	90%	3 sec
ROUTINE	200 bytes – 100 Kbytes	50%	90%	5 sec (<=1200 bytes) 60 sec (<=100 kbytes)

* 90% of the messages required to be completed shall meet the MSG Latency Conditions

Table A-3 WNW Message Performance Static Conditions

MSG Size	MCR	MSG Latency*
200 bytes	80%	2 sec
800 bytes	80%	2 sec
1200 bytes	80%	4 sec
40 Kbytes	80%	240 sec
100 Kbytes	80%	240 sec

* 90% of the messages required to be completed shall meet the MSG Latency Conditions

Table A-4 WNW Message Performance Mobile Conditions

Test Case	Number of Nodes	Number of Mobile Nodes	External Routes	Frequency	Bandwidth	Architecture	Baseline Aggregate Offered Load *
SRW Static (Cleared Vehicle/Soldier Nets)	Up to 40	0	Zero	225-450 MHz	Single 1.2 MHz channel	Single Subnet	Data: Up to 50 kbps Voice: 5 call groups with 20% utilization on each
SRW Mobile (Cleared Vehicle/Soldier Nets)	Up to 40	10 (at ground vehicular speeds up to 55 mph)	Zero	225-450 MHz	Single 1.2 MHz channel	Single Subnet	Data: Up to 25 kbps Voice: 5 call groups with 20% utilization on each

Test Case	Area of Operations	Traffic Characteristics (% measured by bytes)	Multicast Membership
SRW Static (Cleared Vehicle/Soldier Nets)	10km x 10km (Operationally relevant terrain / foliage / noise environment)	20% UDP MC (avg message size = 200 bytes) 20% UDP MC (avg message size = 800 bytes) 20% UDP MC (avg message size = 1200 bytes) 20% UDP UC (avg message size = 200 bytes) 10% TCP UC (avg message size = 40 kbytes) 10% TCP UC (avg message size = 100 kbytes) Bursty, non-uniform traffic	- 50% of multicast to group that all join - 50% of multicast to groups that 30%to 50% of the nodes join

SRW Mobile (Cleared Vehicle/Soldier Nets)	10km x 10km (Operationally relevant terrain / foliage / noise environment)	20% UDP MC (avg message size = 200 bytes) 20% UDP MC (avg message size = 800 bytes) 20% UDP MC (avg message size = 1200 bytes) 20% UDP UC (avg message size = 200 bytes) 10% TCP UC (avg message size = 40 kbytes) 10% TCP UC (avg message size = 100 kbytes) Bursty, non-uniform traffic	- 50% of multicast to group that all join - 50% of multicast to groups that 30% to 50% of the nodes join

*Offered load is defined as the sum of the load offered to the network across all nodes. Each unicast and multicast message is counted once regardless of the number of destinations.

Table A-5 SRW Performance Test Cases

TRAFFIC TYPE	MSG SIZE	% Bytes	% Messages	Messages / Minute 50 kbps Offered Load)	Messages / Minute (25 kbps Offered Load)
UDP MC	200 bytes	20%	41.33%	375	187.5
UDP MC	800 bytes	20%	10.33%	93.75	46.875
UDP MC	1200 bytes	20%	6.89%	62.5	31.25
UDP UC	200 bytes	20%	41.33%	375	167.5
TCP UC	40 Kbytes	10%	0.10%	0.9375	0.46825
TCP UC	100 Kbytes	10%	0.02%	0.375	0.1875

Table A-6 SRW Traffic Profile

PRIORITY LEVEL	MSG SIZE	% Messages	MCR	MSG Latency*
FLASH OVERRIDE	200-800 bytes	3%	95%	1 sec
FLASH	200-800 bytes	6%	95%	1 sec
IMMEDIATE	200-800 bytes	9%	90%	2 sec
PRIORITY	200-1400 bytes	32%	90%	3 sec
ROUTINE	200 bytes – 100 Kbytes	50%	90%	5 sec (<=1200 bytes) 60 sec (<=100 kbytes)

* 90% of the messages required to be completed shall meet the MSG Latency Conditions

Table A-7 SRW Message Performance Static Conditions

MSG Size	MCR	MSG Latency*
200 bytes	80%	2 sec
800 bytes	80%	2 sec
1200 bytes	80%	4 sec
40 Kbytes	80%	240 sec
100 Kbytes	80%	240 sec

* 90% of the messages required to be completed shall meet the MSG Latency Conditions

Table A-8 SRW Message Performance Mobile Conditions

APPENDEX B: Acronym List

Acronym	Meaning
AC	Alternating Current
ACGIH	American Conference of Governmental Industrial Hygienists
AGC	Automatic Gain Control
AKMS	Army key Management System
ANSI	American National Standards Institute
Ao	Operational Availability
API	Application Programming Interface
ASIP	Advanced Special Improvement Program
BIT	Built In Test
BITE	Built In Test Equipment
BW	Bandwidth
CACMB	Cryptographic Algorithm Configuration Management Board
CAGE	Contractor and Government Entity
CBRN	Chemical, Biological, Radiological, and Nuclear
CCI	Controlled Cryptographic Item
CIK	Cryptographic Ignition Key
COE	Common Operating Environment
COMSEC	Communications Security
CREW	Counter Radio-controlled IED Electronic Warfare
CSMA	Carrier Sense Multiple Access
CUAS	Common User Application Software
dB	Decibel
DC	Direct Current
DEW	Directed Energy Weapon
DII	Defense Information Infrastructure
DIACAP	Defense Information Assurance Certification and Accreditation Process
DISR	DOD Information Technology Standards Registry
DOD	Department of Defense
DODISS	Department of Defense Index of Specifications and Standards
DTD	Data Transfer Device
E3	Electromagnetic Environmental Effects
ECU	End Cryptographic Unit
EID	Electrically Initiated Device
EKMS	Electronic Key Management System
EMC	Electromagnetic Compatibility
EME	Electromagnetic Environment
EMI	Electromagnetic Interference

Acronym	Meaning
EMP	Electromagnetic Pulse
EMRADHAZ	Electromagnetic Radiation Hazard
ESD	Electrostatic Discharge
ESH	Environmental, Safety and Health
ESS	Environmental Stress Screening
EW	Electronic Warfare
FDD	Functional Description Document
GFE	Government Furnished Equipment
GHz	Giga-Hertz
GPS	Global Positioning System
HCI	Human-Computer Interface
HEMP	High Altitude Electromagnetic Pulse
HERF	Hazards of Electromagnetic Radiation to Fuel
HERO	Hazards of Electromagnetic Radiation to Ordnance
HERP	Hazards of Electromagnetic Radiation to Personnel
HFE	Human Factors Engineering
HMI	Human Machine Interface
HPM	High Power microwave
HRI	Human Readable Interpretation
IA	Information Assurance
IASRD	Information Assurance Security Requirements Document
IATO	Interim Authorization to Operate
IAW	In Accordance With
ICD	Interface Control Document
IED	Improvised Explosive Device
IER	Information Exchange Requirement
IF	Intermediate Frequency
INFOSEC	Information Security
IP	Internet Protocol
JENM	JTRS Enterprise Network Manager
JCI	JTRS CREW Interoperability
JPEO	Joint Program Executive Office
JTA	Joint Technical Architecture
JTRS	Joint Tactical Radio System
KEK	Key Encryption Key
KG	Key Generation
KHz	Kilohertz
KMI	Key Management Infrastructure
LB	Pound
LOS	Line-Of-Sight
LRU	Line/Lowest Replaceable Unit

Acronym	Meaning
MANET	Mobile Ad hoc Networking
MANPRINT	Manpower and Personnel Integration
MaxTTR	Maximum Time To Repair
MCR	Message Completion Rate
MGRS	Military Grid Reference System
MHz	Mega-Hertz
MILS	Multiple Independent Levels of Security
MLS	Multiple Levels of Security
MNVR	Mid-Tier Networking Vehicular Radio
MPH	Mile Per Hour
MOPP	Mission Oriented Protective Posture
MOS	Military Occupational Series
MSG	Message
MSLS	Multiple Single Levels of Security
MTBEFF	Mean Time Between Effective Failures
MTTR	Mean Time To Repair
NBCC	Nuclear, Biological, Chemical and Contamination
NFPA	National fire Protection Association
NIST	National Institute of Standards and Technology
NSA	National Security Agency
NSL	Near Strike Lightning
OFDM	Orthogonal Frequency-Division Multiplexing
ORD	Operational Requirements Document
OSHA	Occupational Safety and Health Administration
OTAP	Over The Air Programming
OTAR	Over The Air Rekeying
OTAT	Over The Air Transfer
OTAZ	Over The Air Zeroization
PA	Power Amplifier
PLI	Position Location Information
PKI	Public Key Infrastructure
POST	Power On self Test
PRD	Performance Requirement Document
PTTI	Precise Time & Time Interval
QAT	Qualification Acceptance Testing
RCIED	Radio-Controlled Improvised Explosive Device
RF	Radio Frequency
RFI	Radio Frequency Interference
RR	Rifleman Radio
SAASM	Selective Availability Anti-Spoofing Module
SINCGARS	Single Channel Ground and Airborne Radio System

Acronym	Meaning
SiS	Signals in Space
SKL	Simple Key Loader
SLV	Software Loader Verifier
SOW	Statement of Work
SPS	System Performance Specification
SRW	Soldier Radio Waveform
STANAG	Standardization Agreement (NATO)
STAR	System Threat Assessment Report
STRAP	System Training Plan
SW	Software
SWaP	Size, Weight, and Power
TBD	To Be Determined
TCP	Transmission Control Protocol
TRANSEC	Transmission Security
UHF	Ultra High Frequency
UL	Underwriters Laboratories
UMA	Unscheduled Maintenance Action
UWB	Ultra Wideband
VICTORY	Vehicle Integration for C4ISR/EW Interoperability
VMF	Variable message Format
VSWR	Voltage Standing Wave Ratio
WB	Wideband
WF	Waveform
WNW	Wideband Networking Waveform